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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/089,017	07/19/2002	Ralph Wirth	12406-022001	5521

7590 04/28/2003
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225 Franklin Street
Boston, MA 02110-2804

EXAMINER

DOLAN, JENNIFER M

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 04/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/089,017

Applicant(s)

WIRTH ET AL.

Examiner

Jennifer M. Dolan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) Z. 6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2, 3, and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claims 2 and 3, the phrase "in particular" renders the claim indefinite, and in claim 7, the word "preferably" renders the claim indefinite, because it is unclear whether the limitations following the phrases are part of the claimed invention. See MPEP § 2173.02.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,779,924 to Krames et al. (cited by applicant) in view of U.S. Patent No. 5,698,865 to Gerner et al.

Regarding claim 1, Krames discloses a light emitting diode, comprising: a semiconductor layer structure including a substrate (3) and at least one light generating layer (2) formed on the substrate (figure 7c). Krames further discloses a transparent semiconductor epitaxial layer (1), deposited on the light generating layer (figure 7c), a first electrical contact layer (4) on the back

of the substrate (see figure 7c), and a second electrical contact layer (4, portion on top of layer 1) deposited on the semiconductor epitaxial layer, characterized in that the top surface of the semiconductor epitaxial layer has vertical structuring to improve the decoupling of light (figure 7c; see column 3, lines 1-20; column 6, lines 25-52). The semiconductor epitaxial layer (1) of Krames is considered to act as a current-spreading layer, since the current-spreading layer is typically a thin semiconductor layer, similar to that disclosed by Krames. Assuming arguendo, the epitaxial layer of Krames does not constitute a current spreading layer.

Krames fails to specifically disclose the use of a transparent current spreading layer. Krames further fails to disclose that the second electrical contact has a lateral structure.

Gerner discloses a LED using a transparent current spreading layer (6) and having a second electrical contact (9) with a lateral structure (figure 1) by means of which substantially uniform coupling of the electrical current into the current-spreading layer can be achieved (see column 1, lines 21-31; column 2, lines 1-16; column 3, lines 61-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the LED structure of Krames, such that it includes a current spreading layer and an upper electrode with a lateral structure for uniform current coupling, as taught by Gerner. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a current spreading layer and an electrode with lateral structure, because combination of the current spreading layer and laterally disposed electrode structure allows for an even current distribution across the entire surface of the light emitting layer, which results in improved luminous efficiency (see Gerner, column 1, line 65 – column 2, line 16; column 3, lines 61-67).

Regarding claims 2-4, Krames fails to specify the shape of the second electrical contact layer.

Gerner discloses that the second electrical contact layer is a central circular contact surface (figure 1), and arranged about the central contact surface, a contact structure (7) that is rotationally symmetrical with respect to the center point of the central contact surface (structure displays 2 and 4-fold rotational symmetry; see figure 1), and is composed of relatively narrow contact webs. Gerner further discloses that the LED is square shaped, and thus has rotational symmetry matching the rotational symmetry of the contact structure (see figure 1). Gerner even further discloses that the second electrical contact layer is realized as continuous (figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the structure of Krames as modified by Gerner, such that the second electrode has the specified configuration, as further taught by Gerner. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide the specified configuration, because doing so provides a viable central surface for bonding the LED to external circuitry (see Gerner, column 3, lines 55-61), relatively even current injection across the entire area of the LED (see Gerner, column 2, lines 1-16, column 3, lines 61-65), and a relatively small degree of covering/blocking of the luminous surface by the electrodes (see Gerner, column 3, lines 1-9).

Regarding claim 6, Krames, as modified by Gerner, discloses that the second electrical contact layer (Krames, 4,9 adjacent to layer 1) is arranged on structured (see Krames, figs. 10-11) and/or unstructured portions of the current spreading layer (Krames, figure 7c).

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Regarding claim 7, Krames discloses that the vertical structuring is in the form of regularly arranged cones (column 6, lines 25-30; figures 5a-5c).

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Krames et al. in view of Gerner et al. as applied to claim 1 above, and further in view of U.S. Patent No. 6,107,644 to Shakuda et al.

Krames, as modified by Gerner, fails to disclose a discontinuous second electrical contact.

Shakuda discloses that the second electrical contact (8b) for an LED may be equivalently continuous (figure 6b) or discontinuous (figures 7a, 7b) and interconnected by a layer of transparent, light-conducting material (7; figure 6a).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrode of Krames as modified by Gerner, such that it is discontinuous, as taught by Shakuda. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a discontinuous electrode, because Shakuda shows that discontinuous and continuous electrodes may be equivalently employed for providing uniform current distribution to an LED (see Shakuda, column 2, lines 40-46; column 12, lines 21-34; figures 6b, 7a, 7b).

6. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krames et al. in view of Gerner et al. as applied to claim 1 above, and further in view of U.S. Patent No. 5,233,204 to Fletcher et al (cited by applicant).

Krames discloses a method for fabricating a light-emitting diode, characterized in that a light generating layer (2), and thereafter an epitaxial semiconductor layer (1) are deposited on a substrate (3), and the back of the substrate is provided with a first contact layer (4; see figure 7c), vertical structuring to improve the decoupling of light is produced in the surface of the epitaxial layer (figure 7c; see column 3, lines 1-20; column 6, lines 25-52), and a second electrical contact layer (4; portions on top of layer 1) is deposited on the structured surface of the epitaxial layer (see figures 10, 11). Alternatively, for claim 9, Krames discloses that the vertical structuring is outside the areas of the second electrical contact (see figures 7a-7c).

Krames fails to specifically disclose the use of a relatively thick and transparent current spreading layer. Krames further fails to disclose a second electrical contact with lateral structure.

Gerner discloses a second electrode with lateral structure (see figure 1).

Fletcher discloses the use of a relatively thick and transparent current spreading layer (column 1, lines 26-61; column 5, lines 24-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the LED of Krames, so that it includes the lateral structure for the second electrode, as taught by Gerner, and the thick, transparent current spreading layer taught by Fletcher. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide lateral structure for the second electrode, because doing so allows for an even current distribution across the entire surface of the light emitting layer, which results in improved luminous efficiency (see Gerner, column 1, line 65 – column 2, line 16; column 3, lines 61-67). Additionally, a person having ordinary skill in the art would have been motivated to provide a thick, transparent, current-spreading layer, because

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doing so leads to an improvement in the output efficiency of the LED (see Fletcher, column 5, lines 24-37).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. U.S. Patent No. 6,420,735 to Kim discloses a sinusoidal patterning of the top of an LED to decrease total internal reflection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233.

The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd
April 25, 2003


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
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